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(54) Title: ULTRASONIC TRANSCRIPTION SYSTEM STYLUS WITH PERSONALITY CAP

(57) Abstract: A modular stylus is provided for use in an ultrasound transcription system, the modular stylus comprising: a proximal subunit which forms a proximal portion of the stylus and a distal subunit which forms a distal portion of the stylus, the proximal and distal subunits being removably detachable from each other, the proximal subunit comprising a proximal subunit body defining a recess for housing a proximal portion of a writing element which may be housed within the stylus, and a contact switch which detects when the writing element is in contact with a writing surface based on a force of a proximal end of the writing element against the contact switch, and the distal subunit comprising a distal subunit body defining a recess for housing a distal portion of the writing element, a distal end of the subunit body including an opening through which a writing tip on a distal end of the writing element extends, and an ultrasound signal transmitter which transmits position signals to the transcription system.

ULTRASONIC TRANSCRIPTION SYSTEM STYLUS WITH PERSONALITY CAP

BACKGROUND OF THE INVENTION5 Field of the Invention

The present invention relates to a stylus and more particularly to a stylus which may be used in combination with an ultrasound positioning system.

10 Description of Related Art

Ultrasound has been used in a variety of positioning systems. These systems typically involve the transmission of an ultrasound signal and the calculation of the time of flight of the signal. Recently, Virtual Ink, Inc. introduced an ultrasound transcription system, MIMIO™ which is described in detail in PCT Application Serial No. PCT/US99/09879 which is incorporated
15 herein by reference in its entirety. Electronics For Imaging, Inc. also recently introduced an ultrasound transcription system called EBEAM™.

SUMMARY OF THE INVENTION

20

A modular stylus for use in an ultrasound transcription system is provided. In one embodiment, the modular stylus comprises:

a proximal subunit which forms a proximal portion of the stylus and a distal subunit which forms a distal portion of the stylus, the proximal and distal
25 subunits being removably detachable from each other,

the proximal subunit comprising

a proximal subunit body defining a recess for housing a proximal portion of a writing element which may be housed within the stylus,
and

30 a contact switch which detects when the writing element is in contact with a writing surface based on a force of a proximal end of the writing element against the contact switch, and

the distal subunit comprising

a distal subunit body defining a recess for housing a distal portion of the writing element, a distal end of the subunit body including an opening through which a writing tip on a distal end of the writing element extends, and

an ultrasound signal transmitter which transmits position signals to the transcription system.

One feature of the modular stylus is that it allows for a writing element to be loaded into the stylus in a middle of the stylus (i.e., between the proximal and distal subunits) as opposed to on a side or through an end of the stylus.

Operation of the ultrasound signal transmitter which is housed in the distal subunit may be powered by a power source housed in the proximal subunit. Proximal leads may be electronically connected to the power source and the distal subunit may include distal leads which are electronically connected to the ultrasound signal transmitter, the proximal and distal leads being in electronic communication with each other so as to deliver power from the power source to the ultrasound signal transmitter when the proximal and distal subunits are attached to each other.

The stylus may further include an infrared signal transmitter which transmits signals that are used to determine when ultrasound position signals were transmitted. The infrared signal transmitter may be positioned in the distal subunit adjacent the ultrasound transmitter.

The stylus may further include stylus electronics for controlling signal transmissions by the stylus, the electronics being housed in the proximal subunit.

The stylus may further include a middle housing positioned between the proximal and distal subunits for interconnecting the proximal and distal subunits. The middle housing may comprise a transparent window which enables a portion of the writing element to be visible through the middle housing. The middle housing may form a portion of the proximal subunit, a portion of the distal subunit or may be removably attachable to both the

proximal and distal subunits.

The distal subunit may further comprise a cage which surrounds and protects the ultrasound signal transmitter.

5 The stylus may also further comprise a button, situated in either the proximal or distal subunit, which causes the proximal subunit and the distal subunit to disengage from each other.

The present invention also relates to a stylus personality element which may be operably attached to a stylus.

10 In one embodiment, the stylus personality element is removably attachable to the stylus. For example, the stylus personality element may be a cap which is removebly attachable to a proximal end of the stylus, for example the proximal end of the proximal subunit of a modular stylus.

In another embodiment, the stylus personality element affixed to the stylus and is not removeable.

15 The stylus personality element may optionally include multiple settings, the multiple settings serving to identify for the stylus and for the transcription system one or more personality traits of the writing element.

20 The stylus personality element includes a mechanism which identifies for the stylus one or more personality traits of the writing element, the writing surface, the person using the stylus, the writing style of the person using the stylus, and/or the location and other circumstances under which the stylus is being used.

25 For example, the personality element can be used to indicate to the transcription system the type of the writing element (pen, pencil, marker, etc.), the color of the writing element, and/or the shape of the writing tip of the writing element. The personality cap can also be used to indicate the type of writing surface (whiteboard, blackboard, glass, horizontal desk, etc.) to the transcription system.

30 The personality element can also be used to change the function of the stylus. For example, the stylus may be modified to include an eraser adjacent the writing tip. By placing an eraser personality element on the stylus, the

personality of the stylus in the eyes of the transcription system can be converted from a stylus to an eraser.

The personality element can also be used to indicate the person performing the writing. Information may be recorded with the transcription system regarding the writing styles of different people (e.g., whether the person is a fast writer or a slow writer, whether the person writes with a lot of force against the writing surface or writes softly, whether the person is left handed or right handed, the relative angle between stylus and writing surface when the person writes, etc.).

Using information obtained from the stylus personality element about the writer, the transcription system can adjust its performance. For example, the transcription system can alter the way it samples writing data (e.g., sample data more quickly or slowly depending on writing style), alter the way it recognizes when writing is initiated (e.g., make the contact switch more sensitive for soft writers), or alter the way it detects the position of the stylus based on who the writer is and the writer's traits, all identified to the transcription system via the stylus personality element.

The transcription system can also adjust its performance based on information obtained from the stylus personality element about the writing environment. For example, a stylus element may be used to indicate to the transcription system whether the writing environment generates a large amount of echoes. In response, the transcription system can employ signal processing that is more or less echo sensitive.

The personality mechanism used in the stylus personality element may be a plurality of electrical contacts where different combinations of electrical contacts identifies different features associated with the stylus personality element. By attaching a given stylus personality element to a stylus, the stylus may be modified in the eyes of the transcription system by being treated as adopting the characteristics encoded by the stylus personality element.

A novel contact switch for use in an ultrasound transcription system stylus is also provided. In one embodiment, the stylus comprises a stylus body

having a longitudinal axis and defining an elongated recess parallel to the longitudinal axis for housing a writing element within the stylus, the stylus body defining a distal opening through which a writing tip on a distal end of the writing element extends for contacting a writing surface, a contact switch
5 positioned within the stylus body which detects when the writing element is in contact with a writing surface based on a force of a proximal end of the writing element against the contact switch, and an ultrasound signal transmitter which transmits position signals to the transcription system.

In a particular embodiment, the contact switch may comprise a member
10 against which the proximal end of the writing element is biased, the member moving in a direction parallel to a longitudinal axis of the writing element when the writing tip of the writing element contacts a writing surface; a membrane arranged perpendicular to the longitudinal axis of the writing element, a surface of the membrane distal to the member including a conductive layer; and a
15 switching board having a conductive layer aligned with and spaced apart from the conductive layer of the membrane, the conductive layer of the membrane coming into contact with the conductive layer of the switching board when the member moves parallel to the longitudinal axis of the writing element in response to the writing tip of the writing element contacting the writing surface.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1A illustrates an embodiment of an ultrasound stylus according to the present invention.

25 Figure 1B illustrates the ultrasound stylus shown in Figure 1A disassembled into four subunits.

Figure 1C illustrates a set of non-modular styluses.

Figure 1D illustrates a set of modular styluses as a kit of stylus subunits.

Figure 1E illustrates the ability to convert a stylus into an eraser by
30 changing the stylus personality cap.

Figure 2A illustrates an embodiment of an ultrasound stylus and stylus

cover according to the present invention.

Figure 2B is a cross-sectional view of the ultrasound stylus and stylus cover shown in Figure 2A.

5 Figures 3A-3B illustrate exploded views of the ultrasound stylus shown in Figures 2A-2B.

Figure 3A illustrates an exploded view of the proximal subunit.

Figure 3B illustrates an exploded view of the middle housing and distal subunit.

10 Figure 4A illustrates a first exploded view of a membrane contact switch which may be used in an ultrasound stylus according to the present invention.

Figure 4B illustrates a second exploded view of the membrane contact switch shown in Figure 4A.

Figure 4C illustrates a first assembled view of the membrane contact switch shown in Figures 4A and 4B.

15 Figure 4D illustrates a second assembled view of the membrane contact switch shown in Figures 4A and 4B.

Figure 4E illustrates a first exploded view of another embodiment of a membrane contact switch which may be used in an ultrasound stylus according to the present invention.

20 Figure 4F illustrates a second exploded view of the embodiment of a membrane contact switch shown in Figure 4E.

Figure 5A illustrates an exploded view of a three contact clip design for a stylus personality cap which may be used in an ultrasound stylus according to the present invention.

25 Figure 5B illustrates an assembled view of a three contact clip design shown in Figure 5A.

Figure 5C illustrates an exploded view of a four contact clip design for a stylus personality cap which may be used in an ultrasound stylus according to the present invention.

30 Figure 5D illustrates an assembled view of a four contact clip design shown in Figure 5C.

DETAILED DESCRIPTION

The present invention relates to various features that may each independently be incorporated into the design of a stylus for use in conjunction with a transcription system which uses signals such as ultrasound to determine a position of a stylus. The design and operation of a transcription system with which the styluses according to the present invention may be used is described in detail in PCT Application Serial No. PCT/US99/09879 which is incorporated herein by reference in its entirety.

One feature of styluses according to the present invention is their modular design. Figure 1A illustrates an embodiment of an ultrasound stylus according to the present invention in an assembled form. As illustrated, the stylus includes a proximal subunit 12 which may comprise a power source (e.g., a battery), a contact switch, and electronics for controlling operations of the stylus (all internal, not shown). A proximal, non-writing end of a writing element (not shown) extends within the proximal subunit 12 adjacent the contact switch. The writing element may be any implement that may be used on a writing surface, most typically a dry erase marker for use with a whiteboard or chalk for use with a blackboard

Attached to the proximal subunit 12 may be a removable stylus personality cap 26 which may be used to signal to the stylus electronics information regarding the personality of the writing element, the writing surface, the user, the writing style of the user, and/or the conditions under which the stylus is being used. The range of information which the stylus personality cap can communicate and the operation of the stylus personality cap are described herein with regard to Figures 5A-5D.

It is noted that although a removable stylus personality cap 26 is described herein, it is noted that other forms of stylus personality elements may be used. These elements may be removeable from the stylus and each identify one or more personality traits as described herein. Alternatively, these elements may be more permanently affixed to the stylus and have multiple settings, the

different settings serving to identify different personality traits as described herein.

5 The stylus also includes a middle housing 14 which covers the writing element. As illustrated, the middle housing 14 may be transparent in order to render the writing element 16 visible through the middle housing 14.

The stylus also includes a distal subunit 18. The distal subunit 18 comprises an ultrasound signal transmitter 20 adjacent the distal end of the distal unit 18. A cage 21 surrounds and protects the ultrasound signal transmitter 20. The interior of the distal subunit 18 serves as a housing for the
10 distal end of the writing element. As illustrated, the distal writing tip 22 of the writing element extends through a opening in a distal end 24 of the distal subunit 18.

The distal subunit may further include an infrared signal transmitter 19 which transmits signals that are used to determine when ultrasound position
15 signals were transmitted. It is noted that some embodiments of ultrasound positioning systems do not require an infrared signal transmitter and thus this element is non-essential to the stylus.

A stylus cover may be removable attached to the removable stylus personality cap 26 and may also be removably attached to the distal end of the
20 distal subunit 18 in order to cover and isolate the distal writing tip 22 of the writing element 16.

Figure 1B illustrates one embodiment of the modularity of the ultrasound stylus shown in Figure 1A. As illustrated, the stylus is modular in the sense that the stylus can be reversibly separated into multiple subunits. As
25 seen from the figure, the proximal subunit 12 which comprises a power source (e.g., a battery), a contact switch, and/or electronics for controlling an operation of the stylus can be removably detached from the middle housing 14 and the distal subunit 18 comprising the ultrasound transmitter.

It is noted that the middle housing 14 may form a portion of the
30 proximal subunit 12 (and only be removably attachable to the distal subunit), may form a portion of the distal subunit 18 (and only be removably attachable

to the proximal subunit), or as illustrated in Figure 1B, may be a separate subunit and be removably attachable to both the proximal and distal subunits as illustrated. In any of these variations, a feature of the modular stylus of the present invention is that it provides for center loading of a writing element into the stylus as opposed to front, rear, or side loading of a writing element.

In some instances, it may be desirable to have the middle housing be a separate subunit so that different writing elements of different lengths and diameters may be used with the same proximal and/or distal subunits.

The modular design of the stylus illustrated in Figures 1A-1B provides the stylus with several advantages. For example, the modular design of the styluses greatly expands the versatility of a set of these styluses. Figure 1C illustrates a first set of styluses which are not modular. Figure 1D illustrates a second set of styluses which are modular. Without the modular design, each stylus in Figure 1C has to act as its own independent unit. More specifically, the black stylus is always a black stylus and the red stylus is always a red stylus. By contrast, as can be seen in Figure 1D, the modular design of the styluses of the present invention converts the second set of styluses into a kit with multiple stylus personality caps 26A-C; multiple proximal subunits 12A-C; and multiple distal subunits 18A-C (with non-removable multiple middle housings 14A-C in this embodiment).

Imagine that black styluses are used a lot and yellow styluses are not. If the stylus is not modular, when the black stylus breaks, one needs to either use a different color stylus or buy another black stylus. By contrast, when the distal subunit of a modular stylus which happens to have a black personality cap attached to it breaks, one needs to either place a black stylus personality cap on one of the other styluses (e.g., the stylus with the yellow stylus personality cap) or replace the distal subunit on the stylus with the black stylus personality cap with one of the distal subunits.

Also, imagine that one wishes for the transcription system to record some strokes as being broad and other strokes as being narrow. Instead of using different styluses, one can instead employ broad and narrow stylus personality

caps and switch between these caps as need be.

The modular design of the stylus also expands the range of functionalities that may be incorporated into a stylus. For example, as illustrated in Figure 1E, one is able to convert a stylus with a black personality cap 26D and a black marker 16D into an eraser by replacing the black personality cap 26D with an eraser personality cap 26E and by modifying the distal subunit by covering the writing tip of the black marker 16D with an eraser cover 27 so the stylus functions as an eraser (or substituting the writing element 16E with an element with an eraser tip (not shown)).

The modular design of the stylus also simplifies the repair and maintenance of the stylus. By making the proximal subunit housing the contact switch and stylus electronics modular relative to the distal subunit which houses the ultrasound transducer, the proximal and distal subunits can each independently be replaced should either subunit become non-operational.

The modular design of the stylus also simplifies the repair and maintenance of the stylus since any subcomponent may be independently replaced.

The center loading design provided by the modular design is a further advantage by making the writing element 16 readily removable from the stylus, making replacement and color changes rapid and easy to perform.

One issue addressed by the modular design is the need to deliver power from the power source situated in the proximal subunit to the ultrasound transmitter situated in the distal subunit. This is accomplished by employing electrical contacts which allows the power source and stylus electronics in the proximal subunit to be operably connected to the ultrasound transmitter in the distal subunit when the proximal and distal subunits are connected to each other.

Figure 2A illustrates an embodiment of an ultrasound stylus and stylus cover according to the present invention. Figure 2B is a cross-sectional view of the ultrasound stylus and stylus cover shown in Figure 2A.

As illustrated in Figures 2A-2B, proximal subunit 12 comprises a power source 32 (e.g., a battery), a contact switch 34, and electronics 36 for controlling

an operation of the stylus. It is noted that the battery source may optionally be positioned in the stylus personality cap (not shown). The body 38 of the proximal subunit 12 has outer walls 40 which extend in a distal direction to define a recess 42 within which the proximal non-writing end 44 of a writing element 16 extends so that the proximal non-writing end 44 is adjacent the contact switch 34.

A removable stylus personality cap 26 is attached to a proximal end of the proximal subunit 12. Button 43 serves as a mechanism for releasing the personality cap from the proximal subunit 12.

As explained herein in greater detail, multiple different stylus personality caps 26 may be attached to the proximal end of the proximal subunit 12, each different personality cap indicating one or more different characteristics of the writing element, writing surface, writer, writing style of the writer, writing environment to the transcription system. The transcription system can use the personality information obtained from the personality cap to alter the operation of the transcription system in response.

Removably attachable to the removable stylus personality cap 26 is a first stylus cover 28A.

The stylus further includes a middle housing 14 which covers the writing element 16. As illustrated, the proximal portion 46 of the middle housing 14 is designed to fit within the recess 42 formed by the body of the proximal subunit. Any mechanism (friction, screw, flange, etc.) may be used to cause the proximal subunit 12 and the middle housing 14 to be removably attached to each other, thereby separating the proximal and distal subunits from each other. In one embodiment, a twist and pull mechanism is used. Optionally, the middle housing 14 may be designed so it is not removable from the proximal subunit 12.

As illustrated, the middle housing 14 may be transparent in order to render the writing element 16 visible through the middle housing 14. This is advantageous in order to render the color/type of the writing element pen more readily determinable. The length and diameter of the middle housing 14 may be

varied so that the stylus can accommodate different sizes of writing elements. As a result, it is possible to use the same proximal and/or distal subunits with different sized writing elements by varying the size of the middle housing 14.

5 The stylus also includes a distal subunit 18. The distal end of the middle housing 14 and the proximal end of the distal subunit 18 form complimentary lips which allow the middle housing 14 and the distal subunit 18 to be removably attachable to each other. Any mechanism (friction, screw, flange, etc.) may be used to cause the distal subunit 18 and the middle housing 14 to be removably attached to each other. In one embodiment, a twist and pull
10 mechanism is used. Optionally, the middle housing 14 may be designed so it is not removable from the distal subunit 18.

The distal subunit 18 comprises an ultrasound signal transmitter 20 adjacent the distal end of the distal subunit 18. Transmitter electronics 50 are housed within the distal subunit 18. These electronics may be used to deliver
15 power to the transmitter and/or for controlling the operation of the ultrasound signal transmitter 20. The transmitter electronics 50 are operably connected to the power source 32 and the contact switch 34 via leads 52 that extend from the proximal subunit 12 through the middle housing 14 to the distal subunit 18. These leads 52 may be a flex circuit.

20 The distal subunit 18 also comprises an infrared transmitter 19 which transmits signals that are used to determine when ultrasound position signals were transmitted.

A cage 21 surrounds and protects the ultrasound signal transmitter 20. The interior of the distal subunit 18 serves as a housing for the distal end of the
25 writing element 16. As illustrated, the distal writing tip 22 of the writing element 16 extends through a opening in a distal end 24 of the distal subunit 18.

Figures 2A-2B illustrate a second stylus cover 28B which may be removably attached to the distal end of the distal subunit 18 in order to cover and isolate the distal writing tip 22 of the writing element 16. It is noted that the
30 first and second stylus covers 28A and 28B are the same. The stylus cover can be moved between positions adjacent the proximal and distal ends of the stylus.

As illustrated, the stylus cover 28B has an interior housing 56 with an interior recess 58 which serves to isolate the distal writing tip 22 of the writing element 16 and thus prevent the writing tip 22 from drying out. A plurality of supports 60 connect the interior housing 56 to an exterior housing 62 of the stylus cover 28B. Spaces between the supports 60 are a safety feature by allowing air to pass through them if the stylus cover 28B is swallowed. The exterior housing 62 extends over the cage 21 to further protect the ultrasound signal transmitter 20.

Figures 3A-3B illustrate exploded views of the ultrasound stylus shown in Figures 2A-2B. Figure 3A illustrates an exploded view of the proximal subunit. Figure 3B illustrates an exploded view of the middle housing and distal subunit.

In Figure 3A, starting from the proximal end of the stylus, illustrated is a stylus personality cap 70 having dual flanges 71 for securing the stylus personality cap to the body of the proximal subunit 12. A personality contact strip 72 interoperates with the stylus personality cap 70, as explained herein, to indicate the various personalities that the transcription system should associate with the stylus. First battery contacts 74 may also be inserted into the stylus personality cap 70 and placed in contact with battery 76. It is noted that the stylus personality cap may be designed to house the battery (not shown).

Back housing overmold 78 of the proximal subunit 12 serves to house and surround the battery 76. PC board cover 80 serves to immobilize PC board 82. Second battery contacts 84 are positioned between the PC board 82 and battery 76. PC board 82 includes electronics for controlling signal transmission and timing of the stylus.

Membrane 85, actuator 86, contact springs 88, contact pins 90, contacts 92, ring 94, and contact ring 96 form a contact switch for detecting writing. A more detailed description of the construction of the contact switch is provided herein with regard to Figures 4A-4E.

Top and bottom back housings 98A, 98B form the remainder of the outer housing for the proximal subunit 12 and serve to removably connect the

proximal subunit 12 to body housing 14. Actuator button 17 serves to actuate separation of the personality cap 70 from the proximal subunit 12.

As illustrated, writing element 16 is designed to fit within middle housing 14. The proximal end of the writing element 16 abuts the contact switch and is biased away from the contact switch. Contact springs 88 serve to place the battery 76 and other electronics in the proximal subunit 12 in electrical communication with the distal subunit.

Moving to Figure 3B, preload spring 106 serves to bias the writing element 16 against the contact switch shown in Figure 3A. PC board 108 serves to deliver power to the PVDF ultrasound generator 110 and may optionally control the operation of PVDF ultrasound generator 110. Contacts 112 extending from the PVDF 110 operably connect the PVDF 110 to the PC board 108. Cage 114 covers and protects the PVDF 110.

Front housing overmold 116 and front housing 118 form the outer body of the distal subunit 18. The front housing overmold 116 and/or the front housing 118 may serve to removably connect the distal subunit 18 to body housing 14.

Figure 4A illustrates a first exploded view of a membrane contact switch which may be used in an ultrasound stylus according to the present invention.

Figure 4B illustrates a second exploded view of the membrane switch shown in Figure 4A. As illustrated in Figures 4A-4B, ring 94 has a surface 122 against which the proximal end of the writing element is biased. Elastomer pad 124 biases membrane 126 relative to ring 94. Membrane 126 includes conductive layer 128 on a surface of the membrane 126. Spacer 130 separates the conductive layer 128 of the membrane 126 from switch PC board 132. A conductive layer 134 is positioned on the switch PC board 132 so that it is positioned to contact the conductive layer 128 of the membrane 126. Switch PC board 132 is in contact with a main PC board 136 via solder pads 138.

With regard to how the contact switch operates, spacer 130 prevents the conductive layer 128 of the membrane 126 from contacting the conductive layer 134 on the switch PC board 132 and thus closing the switch. When the

proximal end of the stylus is pushed into the ring 94 by the process of writing, the ring 94 pushes the elastomer pad 124 into the membrane 126 to close the gap created between the conductive layers 128, 134 by the spacer 130, thereby closing the switch.

5 Figure 4C illustrates a first assembled view of the membrane switch shown in Figures 4A and 4B. Figure 4D illustrates a second assembled view of the membrane switch shown in Figures 4A and 4B. As can be seen in Figure 4D, solder pads 140 on the main PC board 136 place the switch PC board 132 in electrical contact with a main PC board 136.

10 Figure 4E illustrates a first exploded view of another embodiment of a membrane switch which may be used in an ultrasound stylus according to the present invention. Figure 4F illustrates a second exploded view of the embodiment of a membrane switch shown in Figure 4E. The contact switch illustrated in Figures 4E-4F differs from the contact switch illustrated in Figures 15 4A-4D by its use of a switch contact layer 146 instead of integrating the contacts to the switch PC board 132. Rather, adhesive layer 142 connects the switch contact layer 146 to a plastic support 144. Contacts 148 from the switch contact layer 146 wrap around the plastic support 144 and connect the switch to the main PC board 132.

20 It is noted that a variety of membrane contact switch embodiments other than the designs shown in Figures 4A-F may be employed with the present invention. One advantage of using membrane contact switches is the limited distance that the writing element needs to move in order to activate the switch. This enables the switch to be more sensitive and quicker in its response time. 25 Also, by reducing the amount of force that one needs to apply to the tip of the writing element in order to activate the contact switch, the feel of the operation of the stylus can more closely approximate the feel of writing using an ordinary writing element.

30 A further feature of the present invention is the use of a stylus personality cap 26 attached to the proximal end of the stylus to. Stylus personality caps may be used to introduce and/or modify the personality

associated with a stylus by the transcription system. As used herein, personality refers to the personality of the writing element such as the type of the writing element (e.g., pen, pencil, marker, eraser, etc.), the color of the writing element, and/or the shape of the writing tip of the writing element. Personality also
5 refers to the personality of the writing surface (e.g., whiteboard, blackboard, glass, horizontal desk, etc.). Personality also refers to identity of the person writing as well as the writing style of the writer (e.g., whether the person is a fast writer or a slow writer, whether the person writes with a lot of force against the writing surface or writes softly, whether the person is left handed or right
10 handed, the relative angle between stylus and writing surface when the person writes, etc.). Personality also refers to the personality of the writing environment (e.g., prone to echoes, temperature, location, etc.)

The stylus can read the personality information from the personality cap and adjust its properties accordingly. For example, the stylus can modify the
15 sensitivity of the contact switch (e.g., how much pressure is considered a positive signal, how much delay is employed between activation of the switch and transmission of signals). The stylus can also modify how it transmits signals (e.g., the frequency that position signals are sent).

The stylus can also can read the personality information from the
20 personality cap and communicate that information to the transcription system. The transcription system can then adjust its performance in response to the information obtained from the stylus regarding the personality cap.

For example, by simply switching personality caps, one can change the color personality of the stylus as perceived by the transcription system. Hence,
25 the transcription system can be recording stylus strokes as black strokes. Then, by only swapping the black personality cap to a red personality cap, the stylus can tell the transcription system that the stylus is now red and cause the transcription system to record the stylus strokes as red strokes (even if the writing element is still black).

30 One can also change the identity of the writer for the transcription system by simply changing personality caps. For example, Bob can attach his

personality cap and write using the stylus. The transcription system will record the writing as being performed by Bob based on Bob's personality cap. Bob can then remove his personality cap and hand the stylus over to Jim. Jim can attach his personality cap and start writing. The transcription system will identify
5 from the stylus that Jim's personality cap is attached and record the writing as being performed by Jim. As a result, Jim can have his writing automatically associated with him whenever he uses the transcription system.

The personality cap may include a variety of different mechanisms for encoding personality information. Two embodiments of mechanisms for
10 encoding personality information are provided in Figures 5A-5D

Figure 5A illustrates an exploded view of a three contact clip design for a stylus personality cap which may be used in an ultrasound stylus according to the present invention. Figure 5B illustrates an assembled view of a three contact clip design shown in Figure 5A. Figure 5C illustrates an exploded view of a
15 four contact clip design for a stylus personality cap which may be used in an ultrasound stylus according to the present invention. Figure 5D illustrates an assembled view of a four contact clip design shown in Figure 5C.

As illustrated in Figures 5A - 5D, a disk 170 is sized to be positioned within the recess 172 in the stylus personality cap 174. The disk 170 includes a
20 battery contact 171 and a series of contact jumpers 174 where the battery contact 171 is in electrical contact with the contact jumpers 174. Placing the battery contact 171 in electrical contact with the contact jumpers 174 may be performed by forming the disk from a stamped metal plate.

The contact jumpers 174 are placed in electrical contact with contact
25 strips 178 on PC board 180 as shown in Figure 5B. Battery 182 is placed in electrical contact with the battery contact 171 on the disk 170. As a result, electricity is transmitted from the battery 182 through the battery contact 171 and via the contact jumpers 174 to the contact strips 178 on PC board 180.

The stylus personality cap 174 may be used to indicate to the stylus
30 electronics, which may be on PC board 180, the color of the writing element. This may be done by using different combinations of contact jumpers on the

disk 170 for different colors.

While the present invention is disclosed by reference to the preferred
embodiments and examples detailed above, it is to be understood that these
examples are intended in an illustrative rather than limiting sense, as it is
5 contemplated that modifications and combinations will readily occur to those
skilled in the art, which modifications and combinations will be within the spirit
of the invention and the scope of the appended claims.

CLAIMS

What is claimed is:

1. A stylus for use in a transcription system, the stylus comprising:
a stylus body having a longitudinal axis and defining an elongated recess
parallel to the longitudinal axis for housing a writing element within the stylus,
5 the stylus body defining a distal opening through which a writing tip on a distal
end of the writing element extends for contacting a writing surface;
a signal transmitter which transmits position signals to the transcription
system; and
a stylus personality element which identifies one or more personality
10 features of the stylus to the transcription system.
2. A stylus according to claim 1 wherein the stylus personality element is
removably attached to a proximal end of the stylus body.
- 15 3. A stylus according to claim 1 wherein the stylus personality element is a
cap that is removably attached to a proximal end of the stylus body.
4. A stylus according to claim 1 wherein the stylus personality element has
multiple settings, each setting identifying one or more personality features of
20 the stylus to the transcription system.
5. A stylus according to claim 1 wherein the one or more personality
features identified by the personality element are selected from the group
consisting of a personality of the writing element, a personality of the writing
25 surface, an identity of a person writing, a writing style of the writer, and a
personality of the writing environment.
6. A stylus according to claim 1 wherein the personality features of the
writing element are selected from the group consisting of a type of the writing

element, a color of the writing element, and a shape of the writing tip of the writing element.

5 7. A stylus according to claim 1 wherein the personality features of the writing surface include a type of the writing surface.

8. A stylus according to claim 1 wherein the personality features of the writer include an identity of the writer.

10 9. A stylus according to claim 1 wherein the personality features of the writer are selected from the group consisting of a speed of the writer, a force against a writing surface that the writer writes with, a handedness of the writer, and a relative angle between stylus and writing surface when the writer writes.

15 10. A stylus according to claim 1 wherein the stylus personality element comprises a power source which the stylus utilizes to power the stylus.

20 11. A stylus according to claim 1 wherein the stylus personality element includes a mechanism which encodes the personality features associated with the personality stylus element.

25 12. A stylus according to claim 11 wherein the stylus personality mechanism is a plurality of electrical contacts, the personality features encoded by the personality cap being based on what combination of electrical contacts are present in the stylus personality mechanism.

30 13. A stylus according to claim 1 wherein the stylus transmits signals to the transcription system communicating the one or more personality features of the stylus as encoded by the stylus personality cap, those signals changing in character when a different stylus personality cap having different personality features is attached to the stylus.

14. A stylus according to claim 1 wherein the stylus modifies a sensitivity of a contact switch based on one or more personality features encoded on the stylus personality element attached to the stylus.

5

15. A stylus according to claim 1 wherein the stylus modifies a timing of when signals are transmitted by the stylus in response to the writing element contacting a writing surface based on one or more personality features encoded on the stylus personality element attached to the stylus.

10

16. A stylus according to claim 1 wherein the stylus modifies a signal indicating a color of the writing element based on the color personality feature encoded on the stylus personality element attached to the stylus.

15

17. A stylus according to claim 1 wherein the signal transmitter is an ultrasound transmitter.

18. A method for modifying how a transcription system stylus operates comprising:

20

taking a transcription system stylus which includes a stylus body, a writing element housed within the stylus body, an ultrasound transmitter, and a first stylus personality element, the first stylus personality element having a mechanism which defines a first set of personality features for the stylus;

removing the first stylus personality element from the stylus; and

25

attaching a second stylus personality element to the stylus which defines a second, different set of personality features for the stylus, attaching the second stylus personality element causing the transcription system to recognize a change in at least one of the personality features.

30

19. A method according to claim 18 wherein the one or more personality features defined by the first and second personality caps are selected from the

group consisting of a personality of the writing element, a personality of the writing surface, an identity of a person writing, a writing style of the writer, and a personality of the writing environment.

- 5 20. A method according to claim 18 wherein the personality features of the writing element are selected from the group consisting of a type of the writing element, a color of the writing element, and a shape of the writing tip of the writing element.
- 10 21. A method according to claim 18 wherein the personality features of the writing surface include a type of the writing surface.
22. A method according to claim 18 wherein the personality features of the writer include an identity of the writer.
- 15 23. A method according to claim 18 wherein the personality features of the writer are selected from the group consisting of a speed of the writer, a force against a writing surface that the writer writes with, a handedness of the writer, and a relative angle between stylus and writing surface when the writer writes.
- 20 24. A method according to claim 18, the method further comprising the stylus transmitting signals to the transcription system communicating the one or more personality features encoded by the second stylus personality element.
- 25 25. A method according to claim 18, the method further comprising the stylus modifying a timing of when signals are transmitted by the stylus in response to the writing element contacting a writing surface based on the one or more personality features encoded on the second stylus personality cap.
- 30 26. A method according to claim 18, the method further comprising the stylus modifying a signal indicating a color of the writing element based on the

color personality encoded on the second stylus personality element.

27. A method for modifying how a transcription system stylus operates comprising:

5 taking a transcription system stylus which includes a stylus body, a writing element housed within the stylus body, an ultrasound transmitter, and a stylus personality element, the stylus personality element having multiple settings which defines different personality features for the stylus;

10 changing the settings of the stylus personality element to cause the transcription system to recognize a change in at least one of the personality features.

28. A modular stylus for use in an ultrasound transcription system, the modular stylus comprising:

15 a proximal subunit which forms a proximal portion of the stylus and a distal subunit which forms a distal portion of the stylus, the proximal and distal subunits being removably detachable from each other,

the proximal subunit comprising

20 a proximal subunit body defining a recess for housing a proximal portion of a writing element which may be housed within the stylus, and

a contact switch which detects when the writing element is in contact with a writing surface based on a force of a proximal end of the writing element against the contact switch, and

25 the distal subunit comprising

a distal subunit body defining a recess for housing a distal portion of the writing element, a distal end of the subunit body including an opening through which a writing tip on a distal end of the writing element extends, and

30 an ultrasound signal transmitter which transmits position signals to the transcription system.

29. A stylus according to claim 28 wherein operation of the ultrasound signal transmitter housed in the distal subunit is powered by a power source housed in the proximal subunit.

5

30. A stylus according to claim 29 wherein the proximal subunit includes proximal leads which are electronically connected to the power source and the distal subunit includes distal leads which are electronically connected to the ultrasound signal transmitter, the proximal and distal leads being in electronic communication with each other so as to deliver power from the power source to the ultrasound signal transmitter when the proximal and distal subunits are attached to each other.

10

31. A stylus according to claim 28 wherein the stylus further includes an infrared signal transmitter which transmits signals that are used to determine when ultrasound position signals were transmitted.

15

32. A stylus according to claim 31 wherein the infrared signal transmitter is positioned in the distal subunit.

20

33. A stylus according to claim 28, further comprising a stylus personality cap which is removable attachable to a proximal end of the proximal subunit, the stylus personality cap including a mechanism which identifies for the stylus a physical feature of the writing element.

25

34. A stylus according to claim 33 wherein the stylus personality mechanism is a plurality of electrical contacts where a particular combination of electrical contacts identifies the physical feature of the writing element

30

35. A stylus according to claim 33 wherein the stylus personality cap further comprises a power source for powering the stylus.

36. A stylus according to claim 28 wherein the stylus further includes stylus electronics for controlling signal transmissions by the stylus, the electronics being housed in the proximal subunit.

5

37. A stylus according to claim 36, further comprising a stylus personality cap which is removable attachable to a proximal end of the proximal subunit, the stylus personality cap including a mechanism which identifies for the stylus electronics a physical feature of the writing element.

10

38. A stylus according to claim 37 wherein the stylus personality mechanism is a plurality of electrical contacts where a particular combination of electrical contacts identifies the physical feature of the writing element

15

39. A stylus according to claim 28 wherein the stylus further includes a middle housing positioned between the proximal and distal subunits for interconnecting the proximal and distal subunits.

20

40. A stylus according to claim 39 wherein the middle housing comprises a transparent window which enables a portion of the writing element to be visible through the middle housing.

25

41. A stylus according to claim 39 wherein the middle housing forms a portion of the proximal subunit.

42. A stylus according to claim 39 wherein the middle housing forms a portion of the distal subunit.

30

43. A stylus according to claim 39 wherein the middle housing is removably attachable to both the proximal and distal subunits.

44. A stylus according to claim 28 wherein the distal subunit further comprises a cage which surrounds and protects the ultrasound signal transmitter.

5 45. A stylus according to claim 28 wherein the proximal subunit further comprises a button which causes the proximal subunit and the distal subunit to disengage from each other.

46. A stylus for use in an ultrasound transcription system, the stylus comprising:
10 a stylus body having a longitudinal axis and defining an elongated recess parallel to the longitudinal axis for housing a writing element within the stylus, the stylus body defining a distal opening through which a writing tip on a distal end of the writing element extends for contacting a writing surface, and
a contact switch positioned within the stylus body which detects when
15 the writing element is in contact with a writing surface based on a force of a proximal end of the writing element against the contact switch, and
an ultrasound signal transmitter which transmits position signals to the transcription system.

20 47. A stylus according to claim 46 wherein the ultrasound signal transmitter is positioned adjacent a distal end of the stylus.

48. A stylus according to claim 46 wherein the stylus further includes an infrared signal transmitter which transmits signals that are used to determine
25 when ultrasound position signals were transmitted.

49. A stylus according to claim 48 wherein the infrared signal transmitter is positioned adjacent a distal end of the stylus.

30 50. A stylus according to claim 46 wherein the stylus includes electronics which stylus signal transmissions, the electronics being positioned proximal

relative to the writing element.

51. A stylus according to claim 46 wherein the stylus includes housing for a power source for powering the stylus which is proximal relative to the writing element.

52. A stylus according to claim 46, further comprising a stylus personality cap which is removable attachable to a proximal end of the stylus, the stylus personality cap including a mechanism which identifies for the stylus electronics a physical feature of the writing element.

53. A stylus according to claim 52 wherein the stylus personality mechanism is a plurality of electrical contacts where a particular combination of electrical contacts identifies the physical feature of the writing element

15

54. A stylus according to claim 46 wherein the stylus further includes a transparent window which enables a portion of the writing element to be visible through the middle housing.

55. A stylus according to claim 46 wherein the stylus further comprises a cage which surrounds and protects the ultrasound signal transmitter.

56. A stylus according to claim 46 wherein the contact switch comprises a member against which the proximal end of the writing element is biased, the member moving in a direction parallel to a longitudinal axis of the writing element when the writing tip of the writing element contacts a writing surface;

a membrane arranged perpendicular to the longitudinal axis of the writing element, a surface of the membrane distal to the member including a conductive layer; and

30

a switching board having a conductive layer aligned with and spaced

apart from the conductive layer of the membrane, the conductive layer of the
membrane coming into contact with the conductive layer of the switching board
when the member moves parallel to the longitudinal axis of the writing element
in response to the writing tip of the writing element contacting the writing
5 surface.

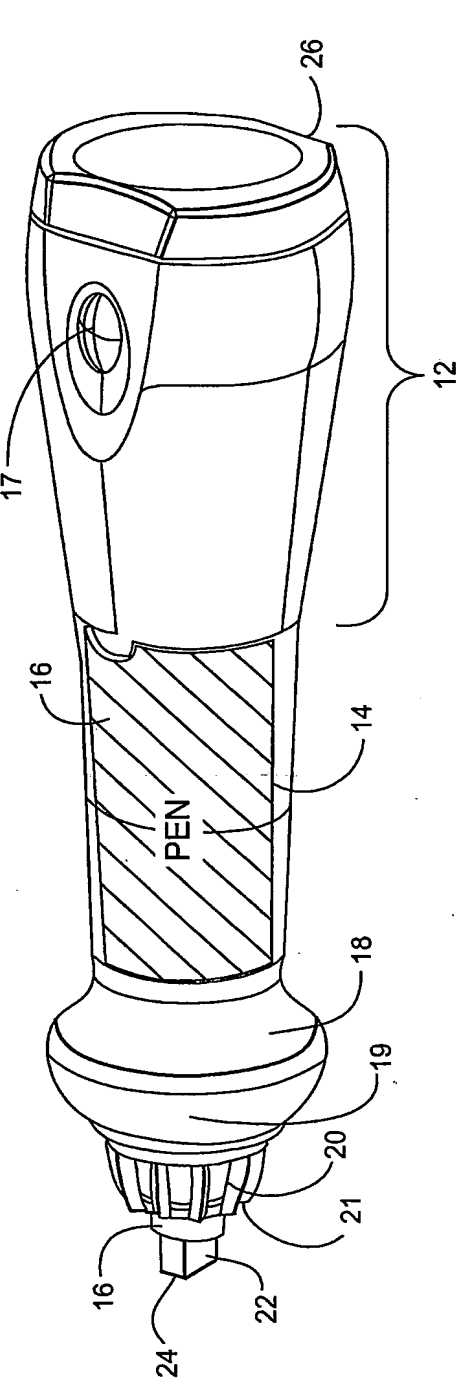


FIG. 1A

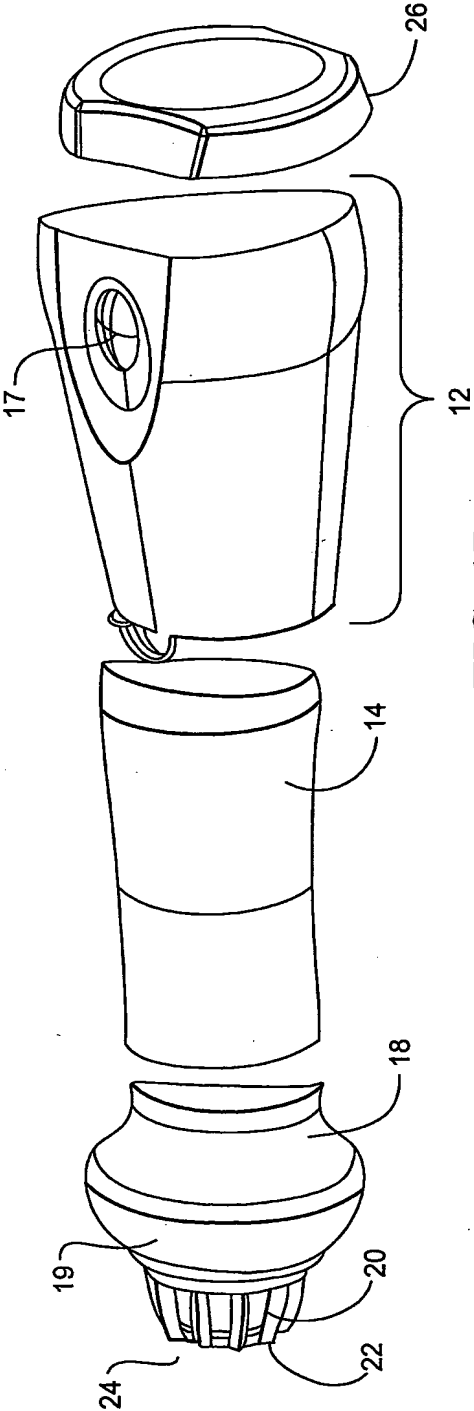


FIG. 1B

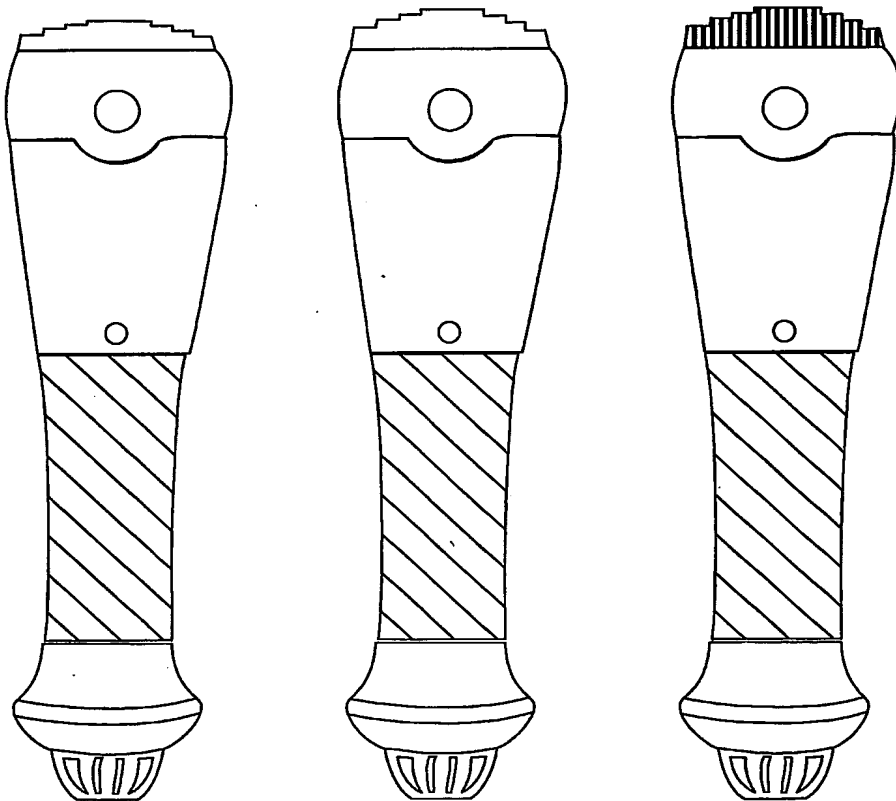


FIG. 1C

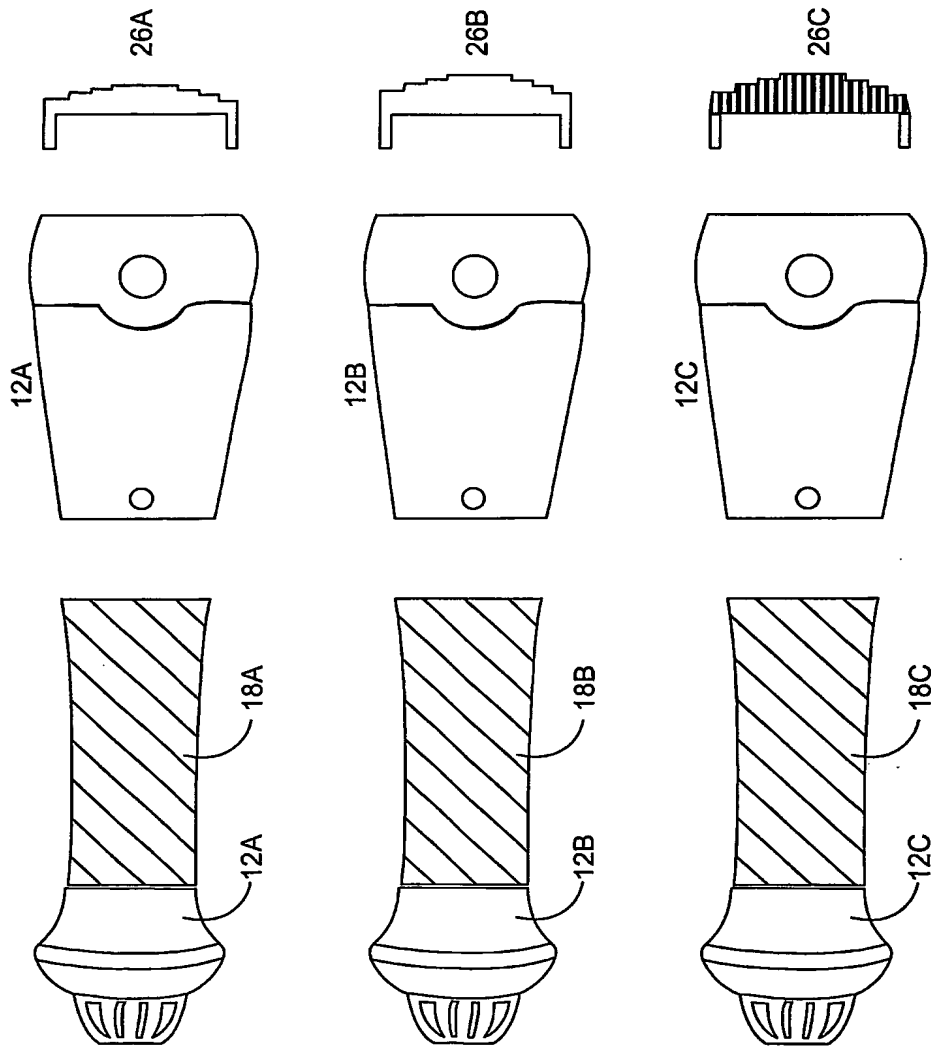


FIG. 1D

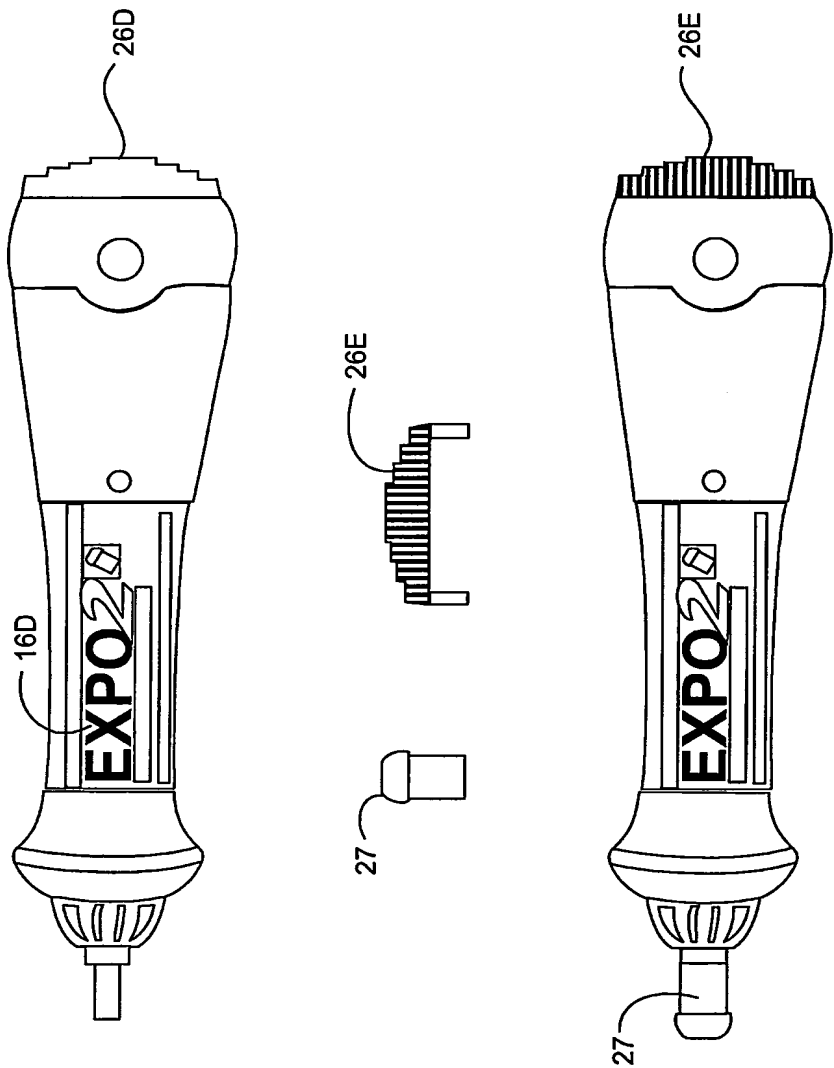


FIG. 1E

5/12

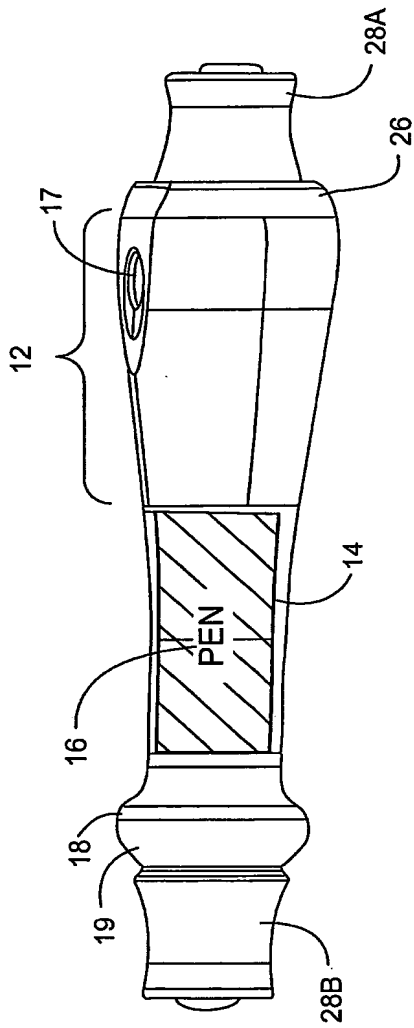


FIG. 2A

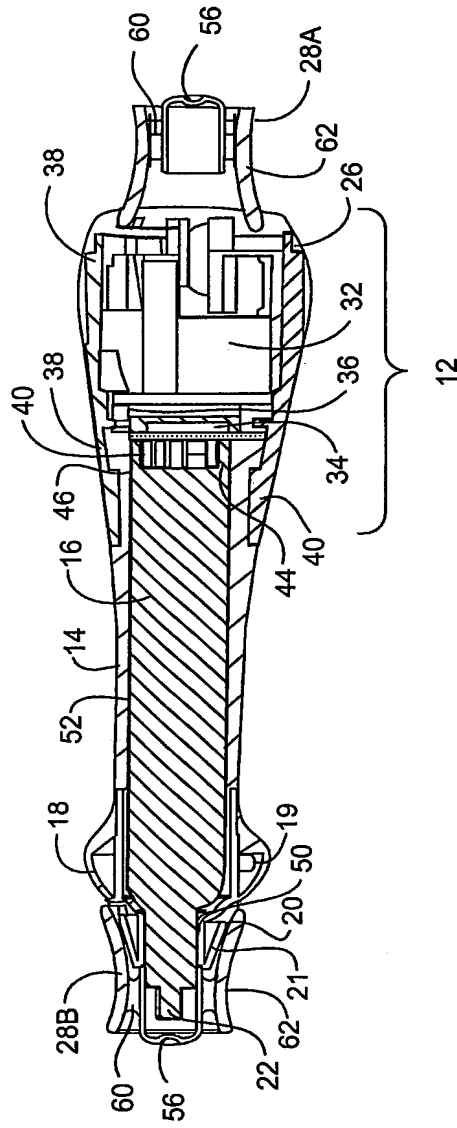


FIG. 2B

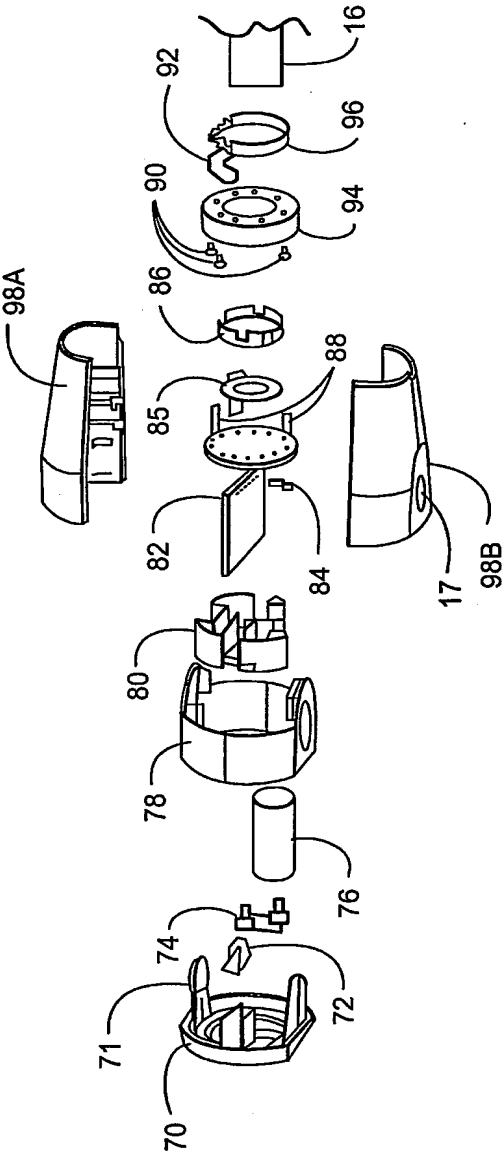


FIG. 3A

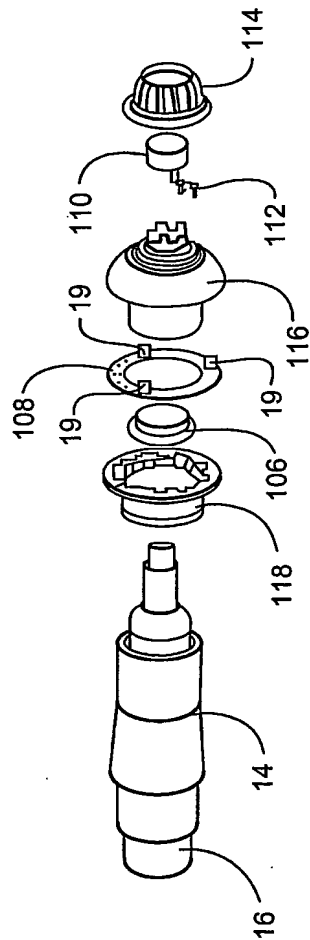


FIG. 3B

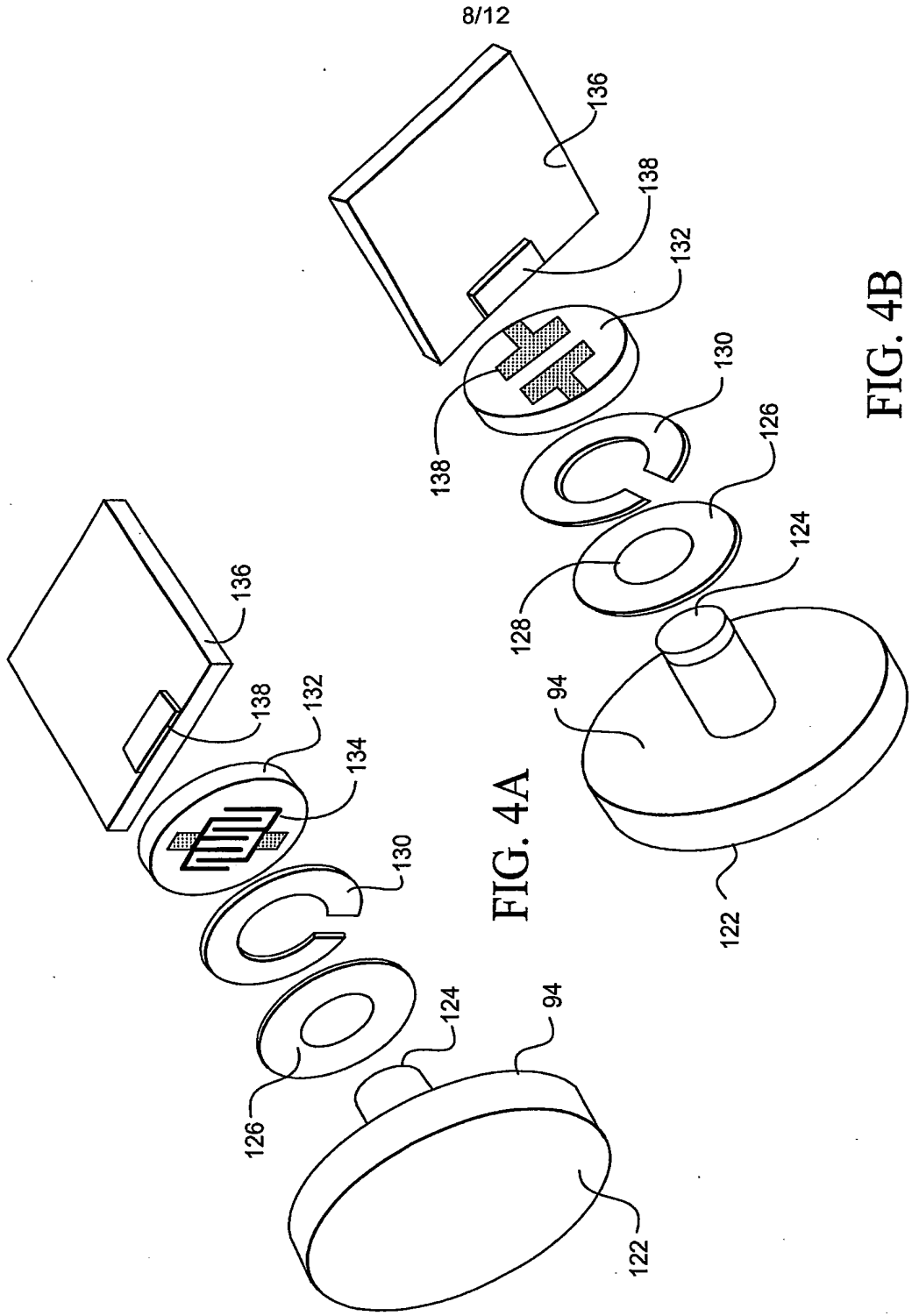


FIG. 4A

FIG. 4B

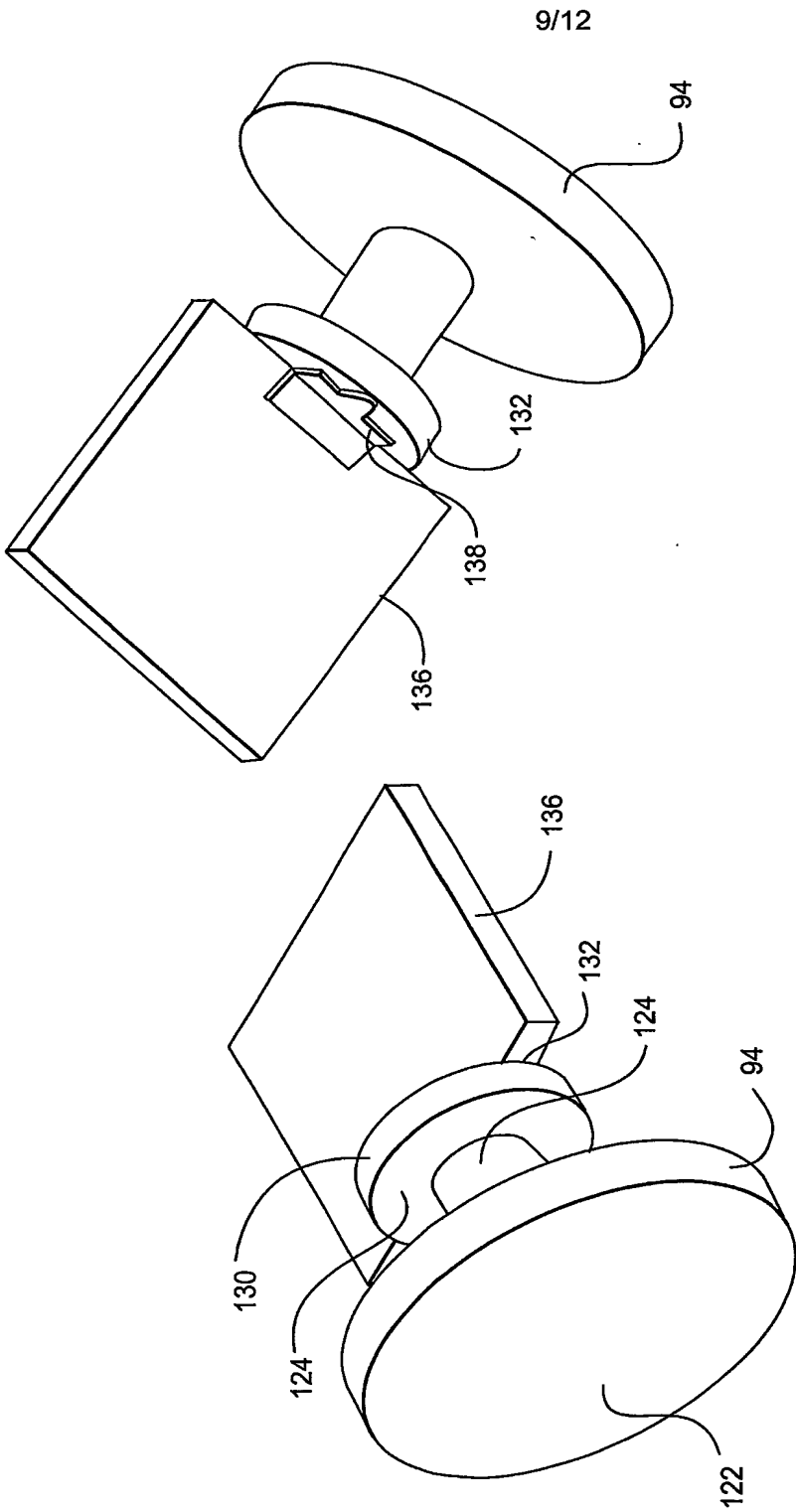


FIG. 4D

FIG. 4C

10/12

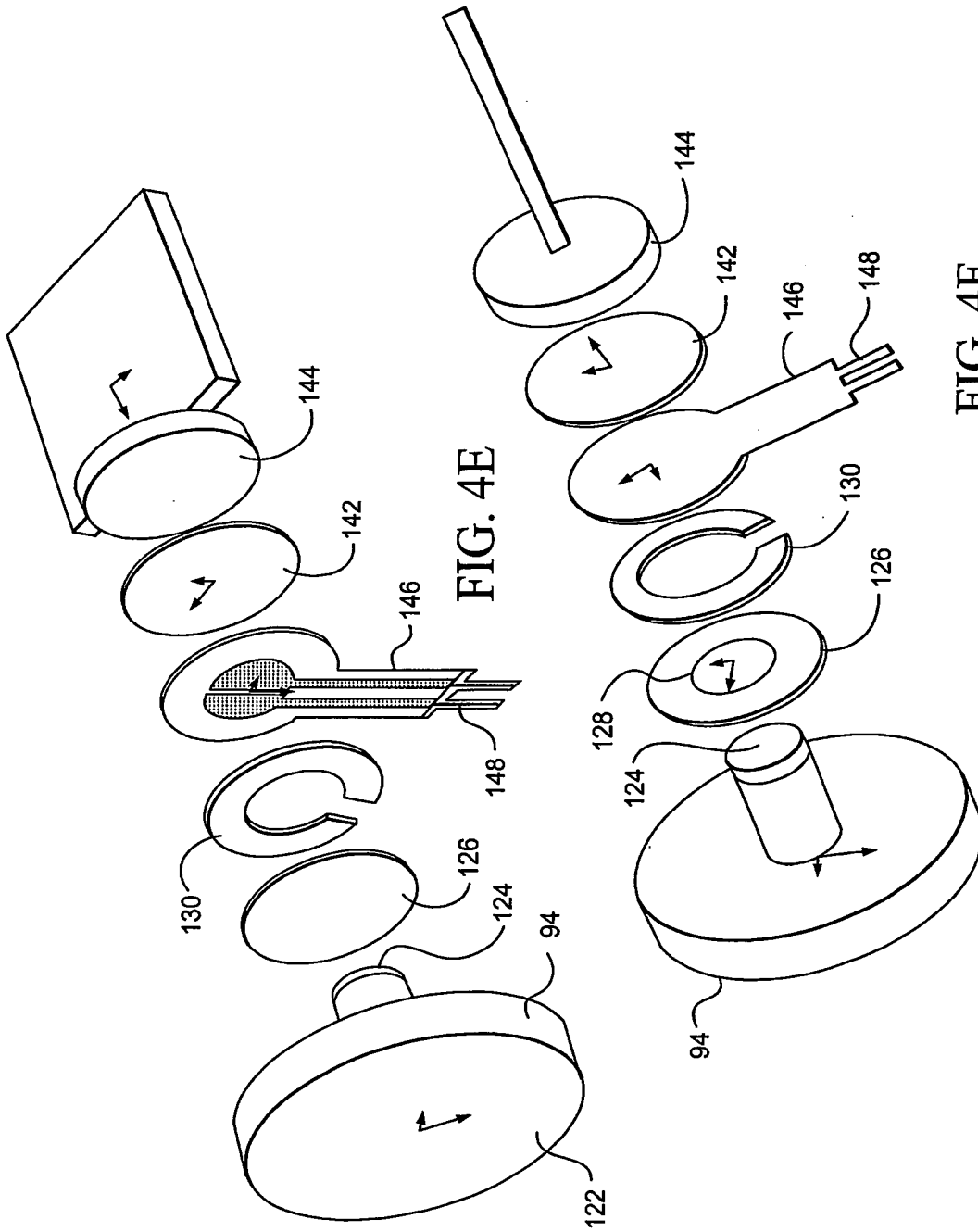


FIG. 4E

FIG. 4F

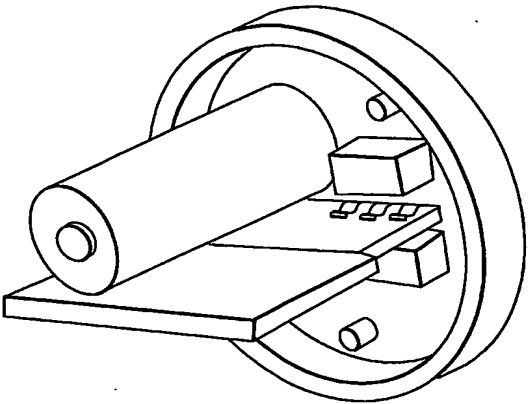


FIG. 5B

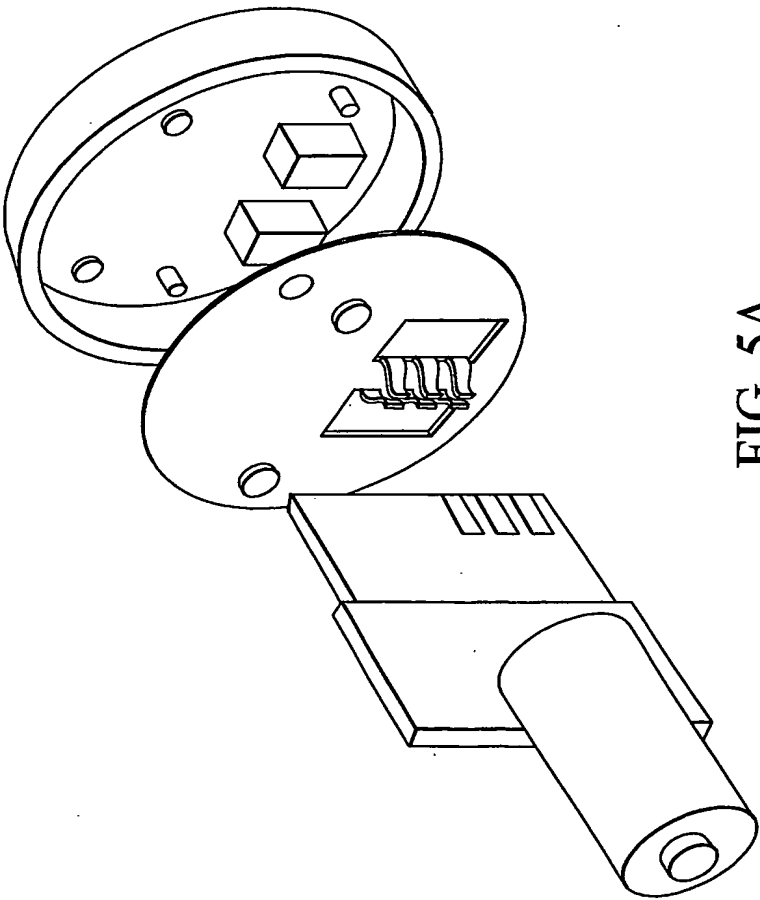


FIG. 5A

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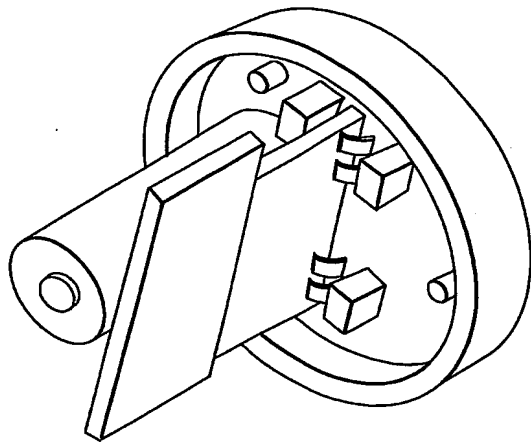


FIG. 5D

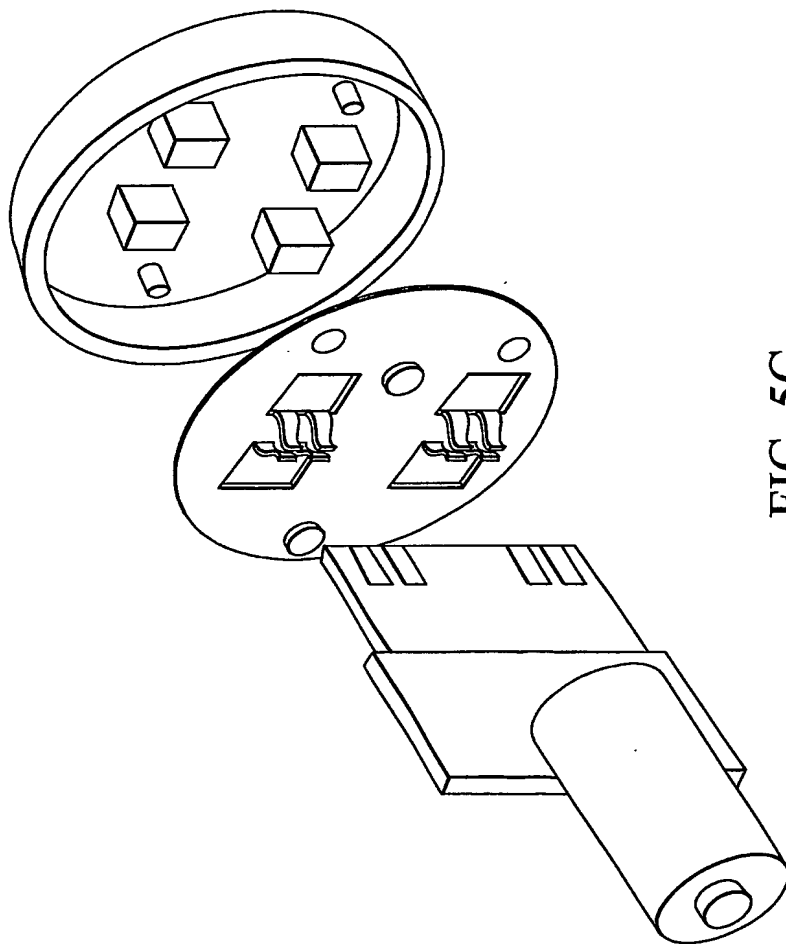


FIG. 5C

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

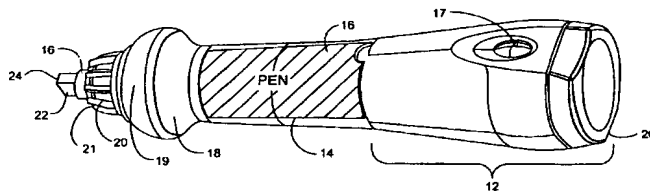
(71) Applicant (*for all designated States except US*): **VIR-TUAL INK CORPORATION** [US/US]; 1360 Soldiers Field Road, Boston, MA 02135 (US).

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(74) Agent: **WEITZ, David, J.**; Wilson Sonsini Goodrich & Rosati, 650 Page Mill Road, Palo Alto, CA 94304-1050 (US).

(54) Title: **ULTRASONIC TRANSCRIPTION SYSTEM STYLUS WITH PERSONALITY CAP**



(57) Abstract: A modular stylus is provided for use in an ultrasound transcription system, the modular stylus comprising: a proximal subunit (12) which forms a proximal portion of the stylus and a distal subunit (18) which forms a distal portion of the stylus, the proximal and distal subunits being removably detachable from each other, the proximal subunit comprising a proximal subunit body defining a recess (42) for housing a proximal portion of a writing element which may be housed within the stylus, and a contact switch (34) which detects when the writing element is in contact with a writing surface based on a force of a proximal end of the writing element against the contact switch, and the distal subunit comprising a distal subunit body defining a recess for housing a distal portion of the writing element, a distal end of the subunit body including an opening through which a writing tip (22) on a distal end of the writing element extends, and an ultrasound signal transmitter (20) which transmits position signals to the transcription system.

WO 02/001466 A3

INTERNATIONAL SEARCH REPORT

 International Application No
 PCT/US 01/20293

 A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 G06K11/18 G06K11/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

 Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 99 59130 A (KELLEY ANDREW III ;VERMINSKI MATTHEW D (US); CHERY YONALD (US); MO) 18 November 1999 (1999-11-18) page 27, line 22 -page 30, line 20 page 39, line 10 -page 42, line 21 page 45, line 5 -page 56, line 17 figures 1A-1E, 2A-2D, 4A-5B, 22-23B ---	1-6,8, 10-13, 16-20, 22,24, 26,27
Y	US 6 064 374 A (FUKUZAKI YASUHIRO) 16 May 2000 (2000-05-16) column 3, line 10 -column 5, line 17 column 5, line 58 -column 6, line 33 figures 1-8B --- -/--	1-6,8, 10-13, 16-20, 22,24, 26,27

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

10 October 2002

Date of mailing of the international search report

21 02 2003

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/20293

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 00 22567 A (ELECTRONICS FOR IMAGING INC) 20 April 2000 (2000-04-20) page 1, line 12 -page 2, line 18 page 13, line 15 -page 14, line 34 figures 1-8 ---	1,4-6,8, 17,18,27
A	EP 0 591 083 A (IBM) 6 April 1994 (1994-04-06) column 2, line 52 -column 4, line 34 figures 2-5B -----	1,4-6, 18,27

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 01/20293

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-27

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-27

Stylus for use in a transcription system, the stylus comprising:
a stylus body having a longitudinal axis and defining an elongated recess parallel to the longitudinal axis for housing a writing element within the stylus, the stylus body defining a distal opening through which a writing tip on a distal end of the writing element extends for contacting a writing surface,
a signal transmitter which transmits position signals to the transcription system,
and a stylus personality element which identifies one or more personality features of the stylus to the transcription system.

2. Claims: 28-56

Modular stylus for use in an ultrasound transcription system, the modular stylus comprising:
a proximal subunit which forms a proximal portion of the stylus and a distal subunit which forms a distal portion of the stylus, the proximal and distal subunits being removably detachably from each other,
the proximal subunit comprising:
a proximal subunit body defining a recess for housing a proximal portion of a writing element which may be housed within the stylus and
a contact switch which detects when the writing element is in contact with a writing surface based on a force of a proximal end of the writing element against the contact switch, and
the distal subunit comprising:
a distal subunit body defining a recess for housing a distal portion of the writing element, a distal end of the subunit body including an opening through which a writing tip on a distal end of the writing element extends, and
an ultrasound signal transmitter which transmits position signals to the transcription system,
the stylus further including an infrared signal transmitter which transmits signal that are used to determine when ultrasound position signals were transmitted.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/20293

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9959130 A	18-11-1999	US 6104387 A	15-08-2000
		US 6124847 A	26-09-2000
		US 6211863 B	03-04-2001
		US 6191778 B	20-02-2001
		US 6177927 B	23-01-2001
		US 6147681 A	14-11-2000
		US 6100877 A	08-08-2000
		US 6111565 A	29-08-2000
		AU 3972399 A	29-11-1999
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